Methods For Developing Novel Dental Nanomaterials For Fillings And Dental Crowns Based On Nano-composite

Published date: March 27, 2014

Technology description

This technology provides synthesis and fabrication of composite materials for dental fillings and other composites for crowns.
This novel composite is made using magnetically aligned single-wall and multi-wall carbon nanotubes, graphite nanoparticles, nano-sized silicon carbide particles (or other carbides) and/or nano-sized aluminum oxide particles (or other oxides) together with polymer systems that cure under UV lights. Additionally crowns can be made by using Hot Isostatic Pressing of a ceramic powder and carbon nanotubes, i.e. by sintering, at a temperature lower than the melting point of both ingredients.

Background

Dental fillings are traditionally made out of fast-setting pastes obtained by mixing solid-liquid components. Most of these filling materials are set by an acid-base reaction (for cement) or by polymerization (for resins). The standard filling is made of Zinc phosphate and is composed particularly of zinc oxide powder and a 50% phosphoric acid solution containing Al and Zn. Problems with existing dental fillings and crowns include interfacial leakages due to cement porosity and bonding issues.

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Publications

On and off-axis tension behavior of fiber reinforced polymer composites incorporating multi-walled carbon nanotubes
Mechanical Performance of Dental Fillers Based on Alumina Nanoparticles
Synthesis and characterisation of nano alumina dental filler
Investigation of the nanomechanical and tribological properties of dental materials

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Application area

Benefits of this technology include teeth fillings and crowns that are stronger, harder, and more wear resistant. The nanoparticles and nanotubes produce a polymer-based filling with modulus, strength, and toughness higher than the same filling without the nanoparticle/nanotubes. We achieve superior toughness, modulus, and strength compared to pure ceramic crowns with the addition of nanotubes to the ceramic crowns. In addition, these fillings are expected to have better polish retention than those based on micro fillers while maintaining better physical properties and wear resistance.

Institution

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